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Procedia - Social and Behavioral Sciences 219 (2016) 367 – 373

Procedia
Social and Behavioral Sciences

3rd Global Conference on Business and Social Science-2015, GCBSS-2015, 16-17 December 2015, Kuala Lumpur, Malaysia

Adding Value to Prime Commodities of Agro-Industry in North Aceh Regency Indonesia

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Abstract

Increasing the value of agro-industries of Aceh using the input-output models will produce some objective function and variable constraints. The independent variable is the actual production and potential production of agricultural commodity and overall yield of agro-industrial products and raw materials. The steady state models and simulation models support of agro-export through Krueng Geukuh. The analysis showed that several centers of production of raw materials are very sensitive to a decrease in productivity of commodity areas. According to the output coefficients for each commodity, the biggest are: animal feed, industrial cocoa and spices. While industries such as cocoa, coffee, coconut, pepper, turmeric and cloves are relatively small, but still larger than one. Therefore, there needs to be additional study as which agro-industrial systems are capable of providing added value to the trade system of Aceh.

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Peer-review under responsibility of the Organizing Committee of the 3rd GCBSS-2015

Keywords: Agro-industry; Index of Technology; Main Commodities

1. Preface

Aceh Logistic Performance Index is one measure of economic progress in four areas (the east coast, the west coast of southern, central Aceh and Regional buffer free port of Sabang in Aceh Besar. Studies on Prospects Commodities In Relation With Agroindustry Development will enhance performance of trade and economic development of this

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Peer-review under responsibility of the Organizing Committee of the 3rd GCBSS-2015
doi:10.1016/j.sbspro.2016.05.057

region. It is understood, according to the review of the logistic system that will lead to local agro-industry growth relies on growth centers such as the city of Lhokseumawe, Banda Aceh, Langsa, and Meulaboh.

Agro-industrial development should promote the potential of the region and the ability of its people. Comparative advantages in the form of natural resources need to be accompanied by increased competitive advantages, which are realized through the creation of human resources and agro-industrial societies that are increasingly professional. For North Aceh Regency society, especially people living in and around the port of Krueng Geukuh, empowerment should target agro-industries. Agro-industrial societies around the region need to continue to be fostered and accompanied by human resource capacity which is more advanced, independent, prosperous, and equitable. Natural and human resources around the North Aceh district should become the basis for the future development of agro-industries. Thus the need to formulate an agro-industry development policy leading to increased added value of agricultural products as well as the ability of people to be able to use natural resources in an optimal and sustainable way. In addition to the development of agro-industries, the regional not agricultural centers can be utilized for engineering appropriate technology to improve business productivity, farmers' income, and the welfare of rural communities, as well as the remove of backwardness.

Opportunities to develop agro-industries in rural areas, among others, include various aspects such as environmental strategy, demand, resources and technology. Builders agro-industry should be applied toward the development of sustainable agro-industries. Agro-industries need to be built and developed which will be noticed as an aspects of the management and conservation of natural resources.

Agro-industry stems from the input set of technologies which are expected to provide added value to the products of agricultural mainstays of Aceh. The agro-industry will also change the nature by which raw agricultural products are turned into products that have more value and have a wider market. The development of the port of Krueng Geukuh would be one solution in the repair of supply networks for exports of agriculture products from this region. There should be industry for the guarantee of the supply of goods and to control the amount of export goods that relate to the delivery capacity of the port Krueng Geukuh. Agricultural products that are seasonal and perishable can be inflows and outflows contributing to the system's agro industry.

Literature Review

For the core economies, the technology index is a simple average of an innovation subindex and an information and communication technology (ICT) subindex, both of which are comprised of hard and soft data. As innovation sub index presented here is different from the “innovative capacity index” constructed by Michael E Porter and Scott Stern in. That measure seeks to explain the underlying factors that contribute to innovation as measured by patents. The innovation subindex here seeks to explain the elements of innovation, such as patents, that are linked measurably to growth (Jeffrey D Sachs, 1998).

The specific results of the nonlinear least squares regression were as follows, with the average annual percentage change in GDP GAP relative to the United States still as the dependent variable in the following equation (Robert J Barro’s, 1991):

Growth = Constant + B1 x 1980s non-core x {N1 {0.5 x ICT subindex + 0.5 [(1 – N2) innovation subindex + N2 x technology transfer subindex]} + (1 – N1) (macroeconomic index + institutional index)} + B2 x 1980s core x {C1 {0.5 x ICT subindex + 0.5 [C2 x innovation subindex + (1 – C2) technology transfer index]} + (1 – C1) (macroeconomic index + institutional index)}

Technological core economies

Core technology index = 1/2 innovation subindex + 1/2 ICT subindex.

Technological non-core economies

Non-core technology index = 1/8 innovation subindex + 3/8 technology transfer subindex + 1/2 ICT subindex.

To construct the technology-in-trade variable, we first calculated the average value of non-primary product exports as a proportion of GDP throughout the 1990s.To ensure the broadest possible reference base, we calculated this not just for the GCR sample, but also for the more than 100 countries for which detailed international trade data are available. Non-primary exports were defined to include most processed textiles and manufactured goods, but not mining products or processed raw materials.xi (World Bank, 2015).

Added value of agriculture product industry are (Knothe, G. el al, 2014):

- Represents a rental charge for the use of the operating capital
- Minimum rate of return the operating capital should earn
- Calculated as the firm's weighted average cost of capital % x invested capital.

Added value of agro-industry is the reward from investing in projects that return above the cost of capital (World Bank, 2015).

For venture capital firms, this trend spells intensified competition in markets already at or past saturation. At issue for both entrepreneurs and venture capital firms is how and when venture capitalists (VCs) can provide meaningful oversight and add value to their portfolio companies beyond the provision of capital. An important way VCs add value beyond the money they provide is through their close relationships with the managers of their portfolio companies (Harry et all, 1996).

Agro-industry is an activity that pays important role in generating added value. The optimal of added value could be achieved through specific industrial pattern with directly integrated with family farming and agricutural enterprises (Tarigan, H, 2007). The role of supply chain in principle is add value to the product by way of raw material procurement efficiency (Hidayat S, and Yani, M, 2012). One of the ways to increase the farmer's access to get food with income increasement with diversification.

Research Method

The method used is a case study, namely conduct in-depth study on the topic of the development of agro-industry commodity in Aceh in connection with Geukuh Krueng port development as a port of export. Deepening of the commodity industry in Aceh mainly in and through the east coast and the region of Central Aceh production centers, and the possibility of development of industry capacity.

The Instrument study prepared is a checklist and guide-depth interviews with key informants that contains: (1) Identification of the development of Agro-industry in North Aceh, (2) Capacity of actual agro-industry and (3) The mechanism of prediction of development and feasibility of the location of agro-industry and (4) Added value of product industry. To complement the in-depth interviews secondary data is collected from reports and Statistic Office of Aceh, Development Planning Office of Aceh concerning the main leading commodity exports mainly supporting Aceh. The analysis model is the input mode with output variable capacity of agro-industry goals for the support of the development of the Port of Krueng Geukuh as an export port. The independent variable is, actual production and potential production of agricultural yield mainstay commodities, agro-industrial products and raw materials. With the steady state models and simulation models supporting, continuing support of agro-export in Krueng Geukuh port.
The proposed formula is as follows:

$(X_{11} + X_{12} + ... + X_{1n}) \leq I_1 C_1$

$(X_{21} + X_{22} + ... + X_{2n}) \leq I_2 C_2$

Where:

X_{11}: Production mainstay Agricultural Commodities (1) actual
X_{12}: the mainstay of Agricultural Commodities Production (2) actual
X_{21}: Potential Product mainstay of Agricultural Commodities (1)
X_{22}: Potential Product mainstay of Agricultural Commodities (2)
I_1 : actual agro-technology index
I_2 : potential agro-technology index
C_1 : Capacity actual Ports
C_2 : Capacity potential Ports

Further included is the propose model, known as input-output (IO) linear model of Leontief. IO models are often used in industrial systems analysis or an economic macro system to examine the structure of linkages between sectors (Miller and Blair, 2009). Through the input-output models, the flow of linkages between sectors in an economy can be shown. The relationship arrangement between input and output distribution is the basic theory underlying the IO models. Simply put, IO models provide information on transactions of goods and services as well as interconnections between units of economic activity for a certain time, which is presented in tabular form. Volume data on the lines

shows the output allocation and volume data according in the column shows the use of inputs in the production industry process in Aceh.

Result and Discussion

Actual Superior Commodities of Aceh

Aceh agricultural commodity consists of commodities and forestry; agricultural and horticultural crops, fisheries and livestock. Most of the production of a commodity is the product of smallholder plantations. Aceh plantation commodity production in 2013 amounted to 403, 826 tonnes consisting of five national commodities and ten prime commodities. Most of these farm products, 61.4 percent are processed in the location of the east coast of agro-industry, the agro-industrial potential as raw materials in North Aceh regency. It is apparent that the growth and development trend of farm production was in the previous period. Mainstay plantation production centers which have the best access to the port of Krueng Geukuh, among others are: Pidie regency, Pidie Jaya, Bireuen, Central Aceh, North Aceh and East Aceh. Six of these regency are the centers for plantations in Aceh province.

The views of key informants supported agro-industry development potential of the port of Krueng Geukuh. Agroindustries that have developed in North Aceh regency are largely a product of plantation and forestry. Total raw materials from plantation subsector are approximately 889.774 tons, among others: (a). palm oil products = 670,000 tons, (b) = 61,000 tons of rubber, (c) coconut = 53,000 tons, (d) coffee = 46,000 tons, and (e) cocoa bean = 25,000 tons. Palm products that are produced consist of palm oil, palm kernel and shell, three types of products that have dominated by palm oil agro-industrial products of Aceh. Coconut products consist of copra, coir and coconut shell charcoal. Rubber products which are exported consist of latex, lump and crum rubber. The resulting coffee product is in the form of coffee bean, consisting of prime quality arabica coffee and robusta coffee. Agricultural products and horticultural crops consist of rice, corn, soybean, chillies and tomatoes. Tomatoes are produced in the central region of Aceh, with good access to the North Aceh. Grain production in the coastal areas of Aceh timur, is largely exported from Aceh via Medan. Surplus grain at harvest for Aceh is estimated between 37 to 42 percent (Aceh Agriculture Office, 2011). Thus the supply of grain exported from Aceh is approximately 600,000 tons per year, through grain traders in each production center, from Aceh Besar to East Aceh regency. Likewise, soybeans produced in this region approximately 53 346 tonnes shipped out of Aceh every year. Horticultural products are mostly marketed outside of Aceh. Horticultural commodity is shipped through the east coast of Aceh amounting to nearly 800,000 tonnes per year. Horticultural products exported from Aceh are: chillies, bananas, potatoes and some vegetables (Aceh Agriculture Office, 2014). These products are sent outside of Aceh in fresh form and very probably could be developed as an agro-industry in the strategic position. Agro-industry food crops that have been grown on the east coast is processing of rice, but the technology operation index is still very small (<0.7). This means that there are still many other agro-industries that can be developed to generate greater added value. Obtained FGD results indicate that there are some constraints on the development of agro-industry and horticulture crops over the years, among others are: (a) seasonal products and management of production, (b) the low quality of human resources,(c) unpredictable security conditions in Aceh that do not support agro-industries development program.

In general the potential of agro-industries would be in the processing of rice flour, animal feed, and a sauce factory in North Aceh regency. The intensity of the supply of raw materials for agro-industry is quite high. The raw material of the commodity potential of the fisheries subsector are namely: fresh fish products from marine catches consisting of: tongkol, tuna, grouper and shrimp. All of these can be developed into a fish processing industry. The raw materials for the industry by product of livestock is also quite good, like animal skin tanning, bone meal and so forth. Acehnese society generally, and in particular the east coast community has a lot of meat goats and cows. Thus by products such as skin and bone can be developed in this livestock-based agro-industrial system.

Potential Products

Potential product is calculated based on the average productivity and potential land development. The basis of the average productivity is the calculation of potential product multiplied by the area of plant cultivation, assuming the use of good technology. Oil palm plantations in Aceh still has an average productivity of 4.877 tonnes per hectare,

but ideally with machinery and better cultivation, it can reach 12 tonnes per hectare per year. This means that products can potentially reach 240 percent of actual conditions. Likewise, the actual cacao still have an average productivity level of 0.444 tonnes per hectare per year. While Ideally with better cultivation techniques, it can reach three times the actual productivity.With the calculation of the increase in crop area and crop management resulting in the intensification of production potential as raw material for agro-industrial plantations can possibly increase between 185% to 225%. This increase is too optimistic, but according to these stakeholders can be achieved if all stakeholders can play a role. When the farm products can potentially reach 2,295,209 tons per year, the agro-industrial capacity will increase from C1 = C2 = 0.47 becomes 0.84. In general, operating conditions agro-industrial above 0.75 is very feasible to be developed. Some commodities which are not feasible are pepper, tobacco and cloves. Three of these commodities experiencing huge fluctuations caused by several factors, among others : (a) Climate change affects the production, (b) Interest in farmering began to decline, due to substitution by other commodities, (c) Normally governments do not prioritize the three commodities.

The possibility of Development and Determination of Capacity

Based on the trend of the last five years and the prediction of potential products, the coefficient of development of agro-ten commodities are shown in Table 1.

Table 1. Capacity Agro-industry Based Raw Materials Raw Material Actual and Potential in North Aceh Regency

`Agroindustry	C_1	Actual Production (ton)	C_2	Potential Production (ton)
Palm Oil	2,381	144,442	5,239	173,918
Coffee	192	57,702	481	144,255
Rubber	237	71,113	593	177,783
Cocoa	111	33,177	332	99,531
Nut	137	41,220	275	82,440
Coconut	291	87,311	582	174,622
Rice	2,000	600,000	2,400	720,000
Chilli	291	87,311	582	174,622
Tomatoes	823	247,000	1.647	494,000
Feed	2,975	892,500	5.950	1,785,000
Indeks AI	**0.47**		**0.84**	

Source: Calculation results (2015)

The calculations show that the development of agro-industry agricultural commodity in North Aceh regency is very feasible to be developed with an installed capacity of between 0.47 to 0.84 of availability of raw materials. The larger the index, the smaller the amount of production in the industry. When the agro-industry index is less than 0.5, it means that the raw materials available amounts to as much as 200 percent of installed industrial capacity. Some commodities which are somewhat sensitive to changes in production are coffee and cocoa. The Coffee mill that has been installed in Central Aceh District and highlands has been very sensitive to the decline in coffee production in this area. Likewise, cocoa began to be developed in Pidie and Pidie Jaya. Based on the output coefficients for each commodity, the biggest are: animal feed, rice industry, and industry sauce (chilli and tomatoes). While the oil palm industry, cocoa, coffee, coconut, rubber, betel nut, turmeric, and ginger are relatively small, but still larger than one. Detailed coefficient results shown in Table 2.

The table above shows that the capacity of agro-industry in the eastern coast can reach 13,234 to 18,080 tonnes per year; the largest industrial capacity that is required is the animal feed industry. Industry quality rice is also high potential with a capacity of 2,400 tonnes per year of five units; and sauce industry with a capacity of 1,647 tonnes per year. CPO industry products (oil, charcoal, compost) are also very supportive of the Krueng Geukuh harbour and

several other locations on the eastern coast of Aceh.

Table 2. Index of Industrial Capacity Each Agro-industry In East Coast of Aceh

Agro-industry	C_1	I_1	C_2	I_2
Palm Oil	413	1.73	5,239	44.01
Coffea	481	2.02	481	4.04
Rubber	593	2.49	593	4.98
Cocoa	332	1.39	332	2.79
Nut	275	1.15	275	2.31
Coconut	582	2.44	582	4.89
Rice	2,400	10.08	2,400	20.16
Chillie	582	2.44	582	4.89
Tomatoes	1,647	6.92	1,647	13.83
Feed	5,950	24.99	5,950	49.98

Source: Calculation results (2015)

Prospects Added Value in the Development of Agro-Industry

Prospects for development of agro-industries in eastern coastal areas of Aceh were examined from various angles, namely: (a) prospects for raw materials, (b) access to centers of development, (c) the feasibility of the investment. Three of these aspects can be answered about the prospect of agro-industry leading commodity in the region. From the point of availability of raw materials, the prospects for agro-industry are indicated by the index of technology and raw materials. From the above, the index of the greatest prospects are animal feed industry with the appeal by 22 times of availability of raw materials (corn, soybean, coconut cake, and waste oil). Similarly, chilli and tomato sauce industry with index 7; which means that the availability of raw materials is seven times the capacity of agro-industry at over 1,600 tons per year. Chilli and tomato raw material can be obtained from at least ten production centers such as: Gayo Lues, Central Aceh, highlands, Pidie, Pidie Jaya, Bireuen, North Aceh and East Aceh. Likewise, access to raw materials spreads from the palm FFB in Bireuen district, North Aceh, East Aceh and Aceh Tamiang. Agroindustrial locations also need to be placed with consideration of travel time and road conditions into development centers.

Based on the feasibility of investment in Agroindustry, as well as some criteria that can be analyzed by Net Present Value (NPV), Net Benefit Cost Ratio (Net B/C); Internal Rate of Return (IRR) and Payback Period (PBP) then seven commodities is very feasible as shown in Table 3.

Table 3. Investment Criteria Eligibility Agro-industry in the Eastern Conference Aceh Agro-industry Investment

Agroindustry	Investment Criteria			
	NPV	Net B/C	IRR	PBP (Tahun)
Palm Oil	1.613.938	1,39	19,39	14
Sauces Industry	3.904.801	1,39	21,11	12
Rice Industry	59.567.287	2,34	29,40	11
Coconut	2.180.304	1,37	20,98	12
Fooder Industry	38.916.889	2,82	34,07	8

Source: Azhar Muslim, et al (2009); Joshua AB, et al (2010); Rahmadsyah et al, (2010)

From the point of investment feasibility of the industry's most reasonble is the rice industry, animal feed industry, industry and other sauces.

Major Problems and Solutions Agro-industrial Development

FGD, with stakeholders in North Aceh faces a few obstacles in agro-industry development in Aceh, among others:(a) primary raw material handling industry is still not sufficient (Palm, Rubber and Cocoa), (b) The market demand for raw materials (coffee and cocoa) is very high, (c) The market for further processed products has not been identified / recorded properly, (d) Cost of production of advanced processed products is relatively more expensive (labor, transportation, raw materials).The primary industry in this area is still small, especially for some of the raw materials, so prospects for growing the downstream industry are still very small. Therefore, to foster agro-industries, there still needs to sufficient primary industry. The next obstacle that most countries still demand requires importers of agricultural products in the form of raw materials, such as cocoa beans, rice, coffee, latex for rubber products. Thus the added value of processed products are in obtaining a country of export. Besides, the cost of transportation from the production center is still expensive, because of the nature of bulky agricultural products. Refined agro-industry market products refined have mostly not been identified so it is difficult to estimate the capacity of refined products produced. Cocoa powder products (cacao butter) and cocoa butter is still limited to the domestic demand. Nevertheless, the amount has not been well identified. Investors superior product for refined products are still not able to estimate the capacity of the product, the price of goods and guarantee return on investment.

Of the constraints above, several strategic steps must be taken, which include: a) Conduct a study on the availability of raw materials, agro-industrial comprehensiveness, and map production centers, b) Promotion of agro-industry, and leading commodity Aceh to investors, both national and foreign investors, c) Looking for a partner who can work in synergy with the agro-industry program in Aceh, d) Identify market of agro-processed products in Aceh, and inform investors, (e) Completing the infrastructure to support agro-industries investment climate in this area.

Conclusions

Results of the study concluded that the development of agro-industry in the northeast coast of Aceh has good prospects, both in terms of availability of raw materials, access to the site of development centers, supporting infrastructure and investment feasibility. Priority development prospects of the largest agro-based industry is rice, fodder, sauce, coconut, palm and ten main commodities for the US.

To develop the potential of agro-industry leading commodity in the northeast coast of Aceh, the government should undertake strategic steps: 1) Conduct a comprehensive agro-industrial study on the availability of raw materials and map production centers, 2) Promoting agro industry leading commodity in Aceh to investors, both national and foreign investors, 3) Looking for a partner who can work in synergy with the programs of agro-industry in Aceh, 4) Identify processed agro-products market in Aceh and inform investors, 5) Completing the infrastructure to support agro-industries investment climate in this area.

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